

Brief Report

Tuberculosis and AIDS Co-Morbidity in Children: Linkage of Databases from Espírito Santo State, Brazil

by Angelica E. Miranda,¹ Reynaldo Dietze,¹ Ethel L. Maciel,¹ Thiago N. Prado,¹ Antonio L. Caus,¹ Murilo M. Silva,¹ and Jonathan E. Golub²

¹Universidade Federal do Espírito Santo (UFES), Núcleo de Doenças Infecciosas (NDI), Vitória, Brazil

²Johns Hopkins University, Center for Tuberculosis Research, School of Medicine, Baltimore, USA

Correspondence: Angelica Espinosa Miranda, Universidade Federal do Espírito Santo, Núcleo de Doenças Infecciosas (NDI), Av. Marechal Campos, 1468, Vitória, 2904-091, Brazil. E-mail: <espinosa@ndi.ufes.br>.

Summary

We assessed the prevalence of AIDS among children diagnosed with active tuberculosis (TB) in Espírito Santo State, Brazil, by linking TB and AIDS surveillance databases using ReLink software and SPSS. Among 411 pediatric TB cases from 2000 to 2006, 27 (7%) were co-infected with AIDS. Most children were unable to provide a sputum specimen; co-infected patients were more likely to be smear negative for acid-fast bacilli (83% vs 46%; $p=0.07$) and culture positive for *Mycobacterium tuberculosis* (44% vs 19%; $p<0.001$). In all, 57% of co-infected patients did not react to tuberculin skin test compared with 17% of TB patients ($p<0.001$). This report emphasizes the significance of AIDS in pediatric TB cases and highlights the importance of evaluating surveillance databases for gaining a better understanding of the burden of co-infection.

Key words: tuberculosis, AIDS, co-infection, children.

Introduction

Though children account for 20% of the global burden of tuberculosis (TB) cases, pediatric TB receives minimal attention from TB control programs [1]. Awareness of pediatric TB has increased in recent years and 1.3 million pediatric TB cases and 450 000 deaths [1] are reported annually in developing countries. In Brazil, 15% of all reported TB cases occur in pediatric patients under the age of 15 [2, 3]. Signs and symptoms of TB disease in children are commonly non-specific and range from asymptomatic to more severe disseminated forms, often accompanied by wasting, and frequently leading to death [4]. HIV infection complicates diagnosis in children because of overlapping symptoms and clinical signs between the two diseases [4, 5].

We linked TB and AIDS Surveillance System databases in Espírito Santo State, Brazil (2006 population = 3.5 million; 29% children <15 years of age) from 2000 to 2006 to estimate the prevalence of AIDS among pediatric TB cases and to compare patient-related factors between AIDS-positive and AIDS-negative children with TB disease.

Methodology

AIDS and TB disease reporting is mandatory in Brazil, though HIV infection is not. The state AIDS database was linked to the TB database after linkage with SINAM (Morbidity Surveillance System Database), SIM (Mortality Surveillance Database), SISCEL (AIDS Laboratory Database) and SICLOM (Antiretroviral Control System Database). The linkage was performed using ReLink software, version 3, with SPSS 13.0 support to identify co-infected cases. Surveillance databases were compared using patient name, mother's name and date of birth with a probability of 92% for names and 90% for dates. State surveillance data for children <15 years of age between 2000 and 2006 were included. Any diagnosis dates of TB and AIDS within 90 days of each other were considered to be diagnosed simultaneously.

The Brazilian National Ministry of Health's Manual of Epidemiological Surveillance for Tuberculosis published recommends that the diagnosis of childhood TB be based on a scoring system [6].

TABLE 1
Demographics, clinical and laboratory characteristics
of children cases in TB database by AIDS from
Espírito Santo State, Brazil

Variables	TB-AIDS, N (%)	TB only, N (%)
Age (years) ^a		
0–2	16 (59.3)	137 (35.7)
3–4	3 (11.1)	62 (16.1)
5–9	7 (25.9)	88 (22.9)
10–14	1 (3.7)	97 (25.3)
Gender		
Male	17 (63.0)	174 (45.3)
Female	10 (37.0)	210 (54.7)
Race		
White	6 (26.1)	80 (27.0)
Black	5 (21.7)	41 (13.9)
Yellow	0 (0)	2 (0.7)
Mixed race	7 (30.4)	139 (47.0)
Unknown	5 (21.7)	34 (11.5)
Year of diagnosis		
2000	4 (14.8)	61 (15.9)
2001	12 (44.4)	52 (13.5)
2002	2 (7.4)	59 (15.4)
2003	6 (22.2)	64 (16.7)
2004	2 (7.4)	51 (13.3)
2005	0 (0)	56 (14.6)
2006	1 (3.7)	41 (10.7)
Disease site		
Pulmonary	17 (63.0)	260 (67.7)
Extra-pulmonary	2 (7.4)	91 (23.7)
Both	8 (29.6)	33 (8.6)
AFB ^a		
Realized	6 (22.2)	114 (29.7)
Positive	1 (16.7)	62 (54.4)
Negative	5 (83.3)	52 (45.6)
Not realized	21 (77.8)	270 (70.3)
Chest X-ray		
Realized	27 (100.0)	366 (95.3)
Suspect	24 (88.9)	302 (82.5)
Normal	0 (0)	51 (14.0)
Another pathology	3 (11.1)	13 (3.5)
Not realized	0 (0)	18 (4.7)
Tuberculin skin test (TST)		
Realized	18 (66.7)	249 (65.0)
No reaction	15 (55.6)	64 (16.7)
Weak reaction	1 (3.7)	21 (5.5)
Strong reaction	2 (7.4)	164 (42.8)
Not realized	9 (33.3)	134 (35.0)
Culture ^a		
Realized	15 (55.6)	119 (31.0)
Positive	12 (44.4)	74 (19.3)
Negative	3 (11.1)	45 (11.7)
Not realized	12 (44.4)	265 (69.0)
Treatment		
New case	23 (85.2)	361 (84.1)
Recurrent	0 (0)	0 (0)
Abandoned	0 (0)	2 (0.5)
Unknown	1 (3.7)	2 (0.5)
Transferred	3 (11.1)	19 (5.0)
DOT		
Yes	4 (14.8)	112 (29.2)
No	18 (66.7)	185 (48.2)
Unknown	5 (18.5)	87 (22.7)

(continued)

TABLE 1
Continued

Variables	TB-AIDS, N (%)	TB only, N (%)
Outcome		
Cure	18 (66.7)	273 (71.1)
Abandoned	0 (0)	14 (3.7)
Death	2 (7.4)	16 (4.2)
Transferred	5 (18.5)	68 (17.7)
Multi-resistant TB	0 (0)	0 (0)
Unknown	2 (7.4)	13 (3.3)

^aPerformed among children with pulmonary disease.

Frequency distributions for categorical data and calculation of median and interquartile range (IQR) for continuous variables were calculated and compared.

The Institutional Review Board of the Federal University of Espírito Santo approved this study.

Results

There were 411 pediatric TB cases reported in Espírito Santo State between 2000 and 2006; 27 (7%) were cross-matched with the AIDS database and labeled as co-infected. The mode of HIV transmission was perinatal for all except one child who was infected through sexual transmission (homosexual practice). The median age for all children was 4 (IQR: 1–9), though co-infected children were younger (median age = 2; IQR: 1–5) than TB cases (4; IQR: 1–10; $p = 0.006$). Demographics of the study population are summarized in Table 1.

Among 27 co-infected patients, 8 (30%) had both pulmonary and extrapulmonary involvement compared with 9% of HIV-negative TB patients ($p = 0.02$). Only 6 (22%) of 27 co-infected children were able to provide a specimen; of which 1 (17%) was smear positive for acid-fast bacilli (AFB) and 12 (44%) were culture positive. Among the 384 HIV-negative children with TB, 62 of 114 (54%) who provided sputum specimens were smear positive for AFB ($p = 0.07$). Co-infected patients were more likely to be culture positive compared with HIV negative TB patients (19% vs 44%; $p < 0.001$). Other factors were similar between groups.

Discussion

We found 7% of pediatric TB patients to be concurrently infected with AIDS in Espírito Santo State, Brazil; 90% of co-infected cases were diagnosed prior to 2004, representing a drop in AIDS-related pediatric TB cases from 2004 to 2006. Pediatric TB in Rio de Janeiro was reported to be 6% in 2003 [7] while a study from South Africa reported

co-infection rates of 22% [8]. Since the introduction of antiretroviral therapy (ART) in Brazil and elsewhere, progression from HIV infection to AIDS has decreased substantially [4] thus time to AIDS is markedly longer as is AIDS notification. In addition to increased ART, more children are receiving treatment for latent TB infection [4, 6].

Although HIV testing is recommended for all TB cases in Brazil, it has not been implemented on a large scale [2, 6]. Children and adults receive treatment for TB and AIDS in public health services free of charge, though the many challenges of diagnosing TB in children are well documented [2–4, 8]. We found significant differences in smear and culture results in co-infected children compared to TB patients without AIDS. Only 17% of co-infected children were smear positive for AFB compared with 54% among HIV-negative children with TB. A prior Brazilian study reported 41% smear positivity among 34% of children who provided the specimen [3]. The low positive predictive value of sputum smear in children is commonly explained by the difficulties associated with collecting sputum specimens from children.

Cure rates in our study were 67% and 77% in co-infected and AIDS-negative patients, respectively. A previous study in Vitória, Brazil, reported that 60% of co-infected children completed treatment between 1990 and 2000, attributing the low proportion to high rates of losses to follow-up [3]. These authors called for increased implementation of DOTS; however, few children in our study received DOTS: 15% in co-infected AIDS/TB and 29% in TB alone.

A pulmonary TB diagnosis among an HIV-infected patient in Brazil is not an AIDS defining illness on its own [9]. Moreover, while AIDS is a reportable disease, HIV-infection is not. Thus, the temporal relationship between an AIDS and TB diagnosis can be difficult to determine. To account for this potential misclassification, we considered diagnoses of TB and AIDS within 90 days of each to be diagnosed simultaneously.

This report emphasizes the significance of AIDS among pediatric TB cases in Brazil, and highlights the importance of evaluating surveillance databases for gaining a better understanding of the burden of co-infection. Health care programs can use these data to develop public health interventions. AIDS surveillance among children with TB contributes to the development of more coordinated and collaborative

approaches for controlling both epidemics. The combination of various surveillance components and data sources improves the knowledge of HIV and TB epidemics within groups at higher risk for both infections. TB-AIDS co-infection remains a significant problem in our region that needs a targeted and informed plan of action.

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